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Observations of a Probable Hybrid Angelfish of the Genus *Holacanthus* from the Sea of Cortez, México[1]

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ABSTRACT: A probable new hybrid angelfish was observed in Cabo San Lucas, Baja California, México. Body coloration was olive brown, with a dark orange area behind the head and a vertical white bar posterior to the pectoral fin. The caudal fin was bright orange red, and pelvic fins were pale yellow. Dorsal and anal fin margins were bright blue and pointed. All characters support the hypothesis that the unidentified pomacanthid is a hybrid of *Holacanthus passer* and *H. clarionensis,* and we suggest a possible explanation for this interspecific hybridization.

THE STUDY OF HYBRIDIZATION may be useful in examining patterns of dispersal and biogeography of fish species. Hybrids can occur when changes in areas of distribution result in two distinct but related species coming into contact that, having originated in separate areas, did not develop reproductive incompatibility (Margalef 1974). Reports of natural hybridization among marine fishes, however, are relatively uncommon (Slastenenko 1957, Schwartz 1981). Butterflyfishes (Chaetodontidae) and angelfishes (Pomacanthidae) contain, in this order, the greatest number of hybrids reported from marine species (see review by Pyle and Randall 1994). Among angelfishes, only 11 hybrids and five other possible hybrids have been reported, none from the eastern Pacific. Here we describe the first probable pomacanthid hybrid from the eastern Pacific and suggest a possible explanation for this rare hybridization.

On 16 March 1997, an unusual pomacanthid was observed by the authors on a vertical wall located in Cabo San Lucas, Baja California, México (22° 52.5′ N, 109° 53.6′ W). This fish was swimming among king angelfish (*Holacanthus passer*) at a depth of 10 m and was followed and recorded for 8 min with a Hi8 videocamera. The specimen could not be identified as any of the four species of pomacanthids known from the tropical eastern Pacific (*H. clarionensis, H. limbaughi, H. passer, Pomacanthus zonipectus*) (Allen and Robertson 1994). Although we could not collect the unidentified specimen, we were able to analyze coloration and morphological traits from the video record, characters that should be used together as diagnostic characters in pomacanthids (Pyle and Randall 1994). The fish was swimming off a vertical wall, grazing on turf algae and in the water column (presumably on zooplankton) at an approximate rate of three bites min^{-1}. The fish spent most of its time swimming back and forth, following the wall.

Coloration and markings of the unidentified pomacanthid were intermediate between those of *Holacanthus passer* and *H. clarionensis* (Figure 1). Background body coloration was olive brown, with the head darker than the body. There was a dark orange area behind the head, almost forming a triangle between the nape, the dorsal fin at the level of the posterior edge of the pectoral fin, and the midline of the body, whereas in *H. clarionensis* there is simply an orange bar from the dorsal spine down to the vent. In

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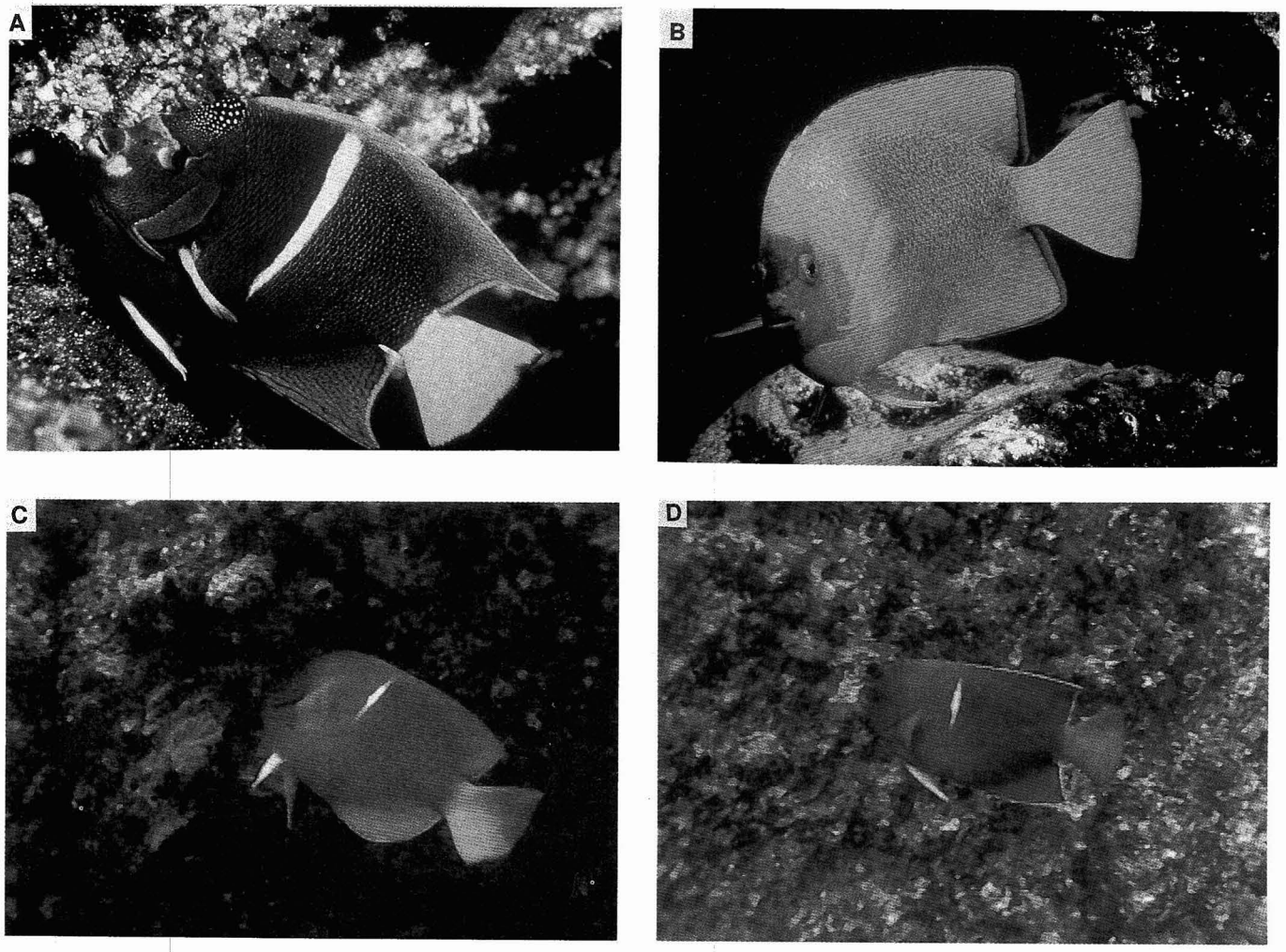

FIGURE 1. Photographs of *A, Holacanthus passer; B, H. clarionensis; C* and *D,* the probable *Holacanthus* hybrid, taken from a Hi8 videotape. The fish is about 25–30 cm total length. Photos *A* and *B* by M. Conlin.

addition, a white bar extended vertically, just posterior to the rear edge of the pectoral fin, from the midline of the body to the dorsal fin; the white bar was shorter and thinner than that of *H. passer.* The caudal fin was bright orange red, without the narrow blue margin typical of *H. clarionensis.* The pectoral fins were orange. The pelvic fins were pale yellow, almost white. The margins of the dorsal and anal fins were bright blue. The fish observed was clearly different from the third species of *Holacanthus* in the region, *H. limbaughi,* because *H. limbaughi* has a distinct white caudal fin and background body coloration is dark blue gray.

The unidentified pomacanthid was approximately 25–30 cm long (total length). Body morphology was very similar to that of both *Holacanthus passer* and *H. clarionensis,* but the fins showed intermediate traits. Dorsal and anal fin margins are rounded in *H. clarionensis* and pointed in *H. passer;* dorsal and anal fin margins were clearly pointed in the unidentified pomacanthid, although not as much as those of *H. passer.*

All observed characters support the hypothesis that the unidentified pomacanthid is a hybrid of *H. passer* and *H. clarionensis.* We believe it is unlikely that the fish observed is a new species of rare *Holacanthus* related to the two species. Cabo San Lucas is one of the most popular sites in Baja California for scuba divers (including underwater photographers), and as far as we know, there have been no reports or photographs of individuals similar to the one described here. Both parent species are found in Cabo San Lucas, although they differ greatly in abundance. *Holacanthus passer* ranges from the central Sea of Cortez to Ecuador and the Galápagos Islands (Thomson et al. 1979) and is the most common pomacanthid in Baja California (Sánchez-Ortiz et al. 1997), reaching densities up to 20 individuals 100 m^{-2} (unpubl. data) and water column aggregations up to 100 individuals (Moyer et al. 1983). *Holacanthus clarionensis* is found at the Revillagigedo Islands and Clipperton Island, but it can also be found in low abundance at the southern tip of Baja California (from Cabo San Lucas to Cabo Pulmo) (Thomson et al. 1979, Allen and Robertson 1994).

It has been hypothesized that interspecific hybridization occurs when conspecific mates are in short supply (Allen 1979). Many hybrid specimens result in areas where one species of a closely related pair is abundant and the other species is rare (Randall et al. 1977, Allen 1979, Moyer 1981). Pyle and Randall (1994), however, questioned why an individual of a common species would mate with an individual of a rare but closely related species, if conspecific mates are available. In Cabo San Lucas, *H. passer* is a common species, but *H. clarionensis* is seldom seen. Although the reproductive unit of *H. passer* is the pair (Moyer et al. 1983), sex ratios in the Sea of Cortez are not always 1 : 1. A recent study has shown that males may be two or three times more abundant than females in areas subjected to strong currents (e.g., Cabo San Lucas), where water column feeding aggregations occur (unpubl. data). This male-skewed sex ratio, observed all year long, may have consequences on reproductive behavior of *H. passer.* Male *H. passer* usually occupy and aggressively defend the same area during reproductive season, and although a male may spawn several times in one evening, females swim directly back to the reef after a single spawning (Moyer et al. 1983). Thus, unless males migrate to other areas during reproductive season, higher numbers of males can produce two situations: (1) a single spawn per male per evening, or (2) some males spawning several times in one evening and other males not spawning at all. In addition there may also be a number of males without established spawning territories. With this excess of males, mating between a male *H. passer* and a female *H. clarionensis* may result. Because only solitary individuals of *H. clarionensis* have been observed in Cabo San Lucas and male *H. clarionensis* are rare, we hypothesize that a hybrid between a male *H. passer* and a female *H. clarionensis* is the most likely scenario.

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